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Knirsch, Walter ; et al

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SHORT REPORT

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Percutanous closure of patent ductus arteriosus in small infants of less than 8 kg body weight using different devices

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Therapeutic closure of patent ductus arteriosus (PDA) may become necessary in small infants with congestive heart failure refractory to medical management, regardless of the age or weight of the patients. Percutanous closure of PDA offers an alternative to surgical treatment [3,4]. The aim of this retrospective, multicentre observational trial was to evaluate the immediate results and mid-term clinical and echocardiographic follow-up of percutanous closure of PDA in young infants weighing less than 8 kg. Four centres were involved.

Percutanous PDA closure was performed in 25 patients (16 female, 9 male) with a body weight of less than 8 kg (mean age 9.2 months, mean body weight 6.3 kg). The mean dimensions of the PDA were 5.9 mm at the aortic end and 2.7 mm at the pulmonary end with a mean of 2.2 mm at the narrowest part. Mean pulmonary artery pressure was 22.6 mm Hg, Qp:Qs = 2.2 to 1 and Rp:Rs = 0.13 to 1. Two patients had an additional atrial septal defect and one patient had an aorto-pulmonary collateral, which were closed during the same cardiac catheterisation (Table 1). Mean fluoroscopy time was 15.0 min. For a tubular shaped PDA, the preferred device was the pfm Ductocclud coil (pfm-AG, Cologne, Germany) or Cook detachable coils (Cook Inc., Bloomington, IN, USA). For a fenestrated PDA, the Amplatzer Duct Occluder (AGA Medical Corp., Golden Valley, MN, USA) was used. The PDA was closed according to standardised procedures [5].

The Amplatzer Duct Occluder (ADO) was used in 17 patients, Cook detachable coils in six patients, and the pfm Ductocclud coil in two patients (Table 1). In two patients (one with a body weight of 3.3 kg), percutanous PDA closure failed due to protrusion of the device into the aorta or left pulmonary artery; these infants successfully underwent surgical PDA closure (Table 1). Complete closure was achieved in all patients: immediate occlusion in 13 patients, the following day in four patients, and after mid-term follow-up (6 months) in six patients. In one patient, the Cook detachable coil migrated to the right pulmonary artery 1 day after the intervention; the coil was retrieved and the PDA was closed with an ADO (Fig. 1). In all patients, symptoms of heart failure resolved and medical treatment could be terminated. At mid-term follow-up (mean 18.8 months) Doppler echocardiography revealed mild flow velocity acceleration in the left pulmonary artery in two patients and in the descending aorta in one patient. Special attention was given to monitoring femoral vessel patency after catheterisation. There were no other complications (haematoma, femoral artery thrombosis, haemolysis, infection, haemorrhage or recanalisation).

The rate of percutanous closure of PDA was comparable to other studies in small children of less than 10 kg body weight described by Aydogan et al. [1] (94%) or by Dalvi et al. [2] (90%), although we used other device types, depending on the morphology of the PDA.

We conclude that percutanous closure of PDA is a feasible, safe and effective method in infants of between 4 and 8 kg body weight.

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Table 1 Overview of the 25 patients with a body weight of less than 8 kg with percutanous PDA closure using different devices

Patient	Sex	Age (years)	Body weight (kg)	Venous sheath	Arterial sheath	Devices	X-ray time (mins)	Occlusion	Special aspects
1	F	1.43	7.83	5	4	Amplatzer Duct Occluder	29.8	During 48 h	Aorto-pulmonary collateral closure during same procedure
2	Ff	0.19	4.20	5	4	Amplatzer Duct Occluder	14.3	Immediately	
3	M	0.91	6.74	5	4	Pfm Ductocclud coil	10.8	After 6 months	
4	Ff	1.43	7.90	5	5	Cook detachable coil	17.5	Immediately	
5	Ff	1.06	8.00	6	4	Amplatzer Duct Occluder	13.0	Immediately	
6	M	0.14	4.70	5	4	Amplatzer Duct Occluder	11.8	Immediately	
7	M	0.76	7.50	5	4	Amplatzer Duct Occluder	14.9	Immediately	
8	F	0.45	6.90	4	4	Pfm Ductocclud coil	18.6	Immediately	
9	M	0.28	3.33	6	3	Amplatzer Duct Occluder; pfm Ductocclud coil	10.4	Not possible	
10	F	1.91	7.20	6	4	Amplatzer Duct Occluder	14.0	During 48 h	
11	F	0.69	7.60	6	4	Amplatzer Duct Occluder	7.5	After 6 months	
12	F	0.56	5.80	6	4	Amplatzer Duct Occluder	20.2	During 48 h	Left pulmonary artery flow velocity <2 m/s
13	F	0.57	5.55	6	4	Amplatzer Duct Occluder	13.1	After 6 months	Left pulmonary artery flow velocity <2 m/s
14	M	0.36	3.50	6	4	Cook detachable coil	10.1	During 48 h	
15	F	1.65	8.00	-	4	Cook detachable coil	4.9	After 6 months	
16	F	1.13	8.00	6	4	Amplatzer Duct Occluder	20.3	Immediately	Atrial septal defect closure during same procedure
17	F	0.88	5.30	6	4	Amplatzer Duct Occluder	13.2	Immediately	Reduced arterial perfusion for 72 h
18	M	0.57	7.60	6	4	Amplatzer Duct Occluder	9.2	Immediately	
19	F	0.56	7.10	6	4	Amplatzer Duct Occluder	9.4	Immediately	
20	F	0.61	6.80	6	4	Cook detachable coil; Amplatzer Duct Occluder	32	Immediately	Embolisation
21	F	0.76	6.90	6	4	Amplatzer Duct Occluder	20.5	Immediately	Descending aorta flow velocity acceleration 2.5 m/s
22	M	1.43	6.40	6	4	Amplatzer Duct Occluder	7.8	Immediately	
23	M	0.27	4.00	6	–	Cook detachable coil	21.4	After 6 months	Atrial septal defect closure during same procedure
24	M	0.11	4.10	4	–	Cook detachable coil	19.3	After 6 months	Right-sided PDA
25	F	0.54	6.20	6	4	Amplatzer Duct Occluder	11.3	Not possible	

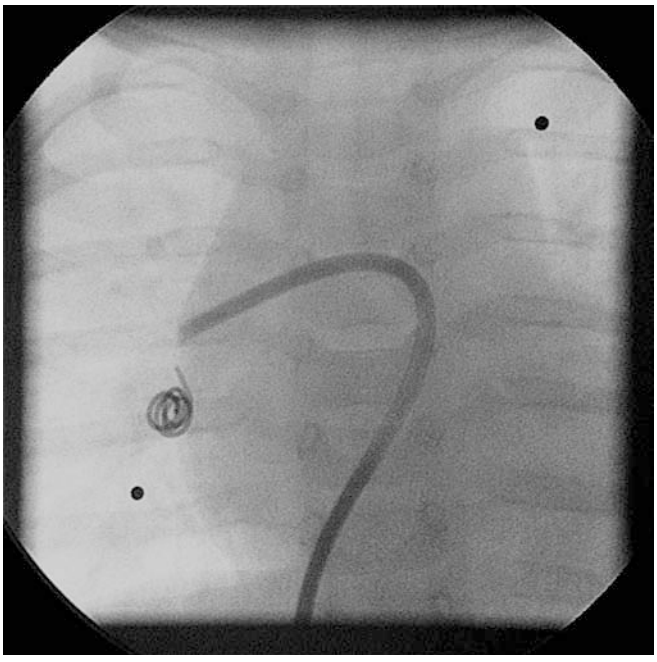

Fig. 1 Posterior-anterior chest X-ray film showing the embolised Cook detachable coil in the right pulmonary artery. A 6 F long sheath was introduced into the right pulmonary artery and the Cook detachable coil was retrieved into the sheath using a snare catheter. Afterwards the sheath was used to implant the ADO

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